Watershed-Based Nonpoint Source Pollution Control Plans

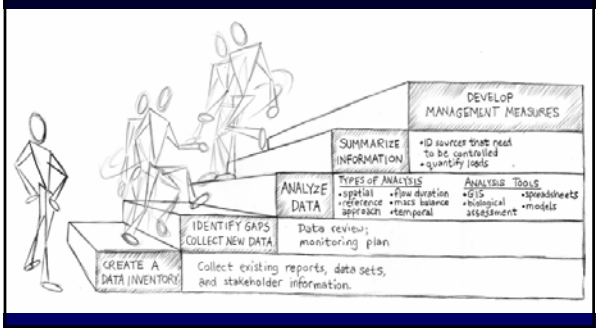
a. Identify stressors & sources to be controlled
b. Estimate load reductions expected from BMPs
c. Describe mgmt measures & targeted critical areas
d. Estimate TA, $$, & source required for implementation
e. Describe info & education needed to promote BMPs
f. Develop schedule for implementation of BMPs, assign tasks
g. Describe interim, measurable milestones
h. Identify criteria to measure progress
i. Develop monitoring component

Source: US EPA 2004 319 Supplemental Guidelines

Estimating Pollutant Reductions

- Estimate pollutant inputs from watershed sources identified during assessment phase
- Identify target reductions needed to meet goals

Watershed analysis is on ongoing learning process – iterative & creative!



Reducing pollutant inputs: the basics

- Simple (linear) approach
  - Use observed data
  - Empirical relationships
  - Reduce the concentration
  - Reduce the source area
  - Reduce # of sources
- Complex (modeled) approach
  - Model the loadings
  - Model BMP reductions
  - Layers can include topography, soils, climate, land use, land cover, pollutant transport/fate, point sources, management practices, etc.

Description of the NPS management measures needed

- Management measures or BMPs should be linked to (or otherwise address) stressors and sources
  - Estimates for pollutant removal rates or general effectiveness should be included
  - Can be based on typical ranges, i.e., percentage removed/treated, reasonable estimates, etc.
- Specify or map areas where BMPs will be used or installed
  - Examples: all abandoned mine sites with dry weather flows; all streambanks along upper reaches; livestock facilities on Willow Run; etc.

http://www.epa.gov/owow/nps/agmm/index.html

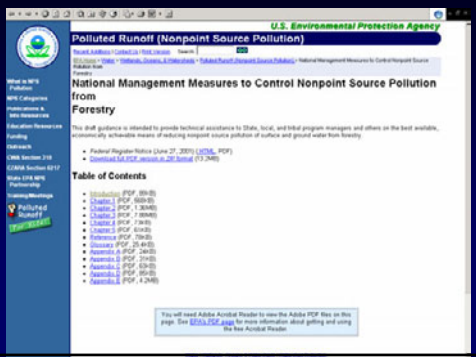
http://www.epa.gov/owow/nps/agmm/index.html

Table 4d-6. Relative gross effectiveness[a] (load reduction) of animal feeding operation control measures (Pennsylvania State University, 1992b).

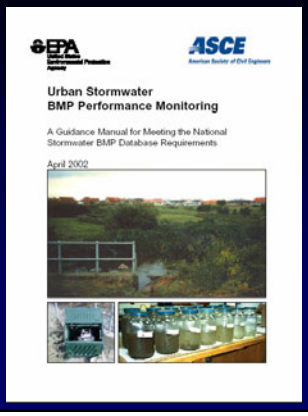
Practice[b] Category	Runoff Volume	Total[d] Phosphorus (%)	Total[d] Nitrogen (%)	Sediment (%)	Fecal Coliform (%)
Animal Waste Systems[e]	reduced	90	80	60	85
Diversion Systems[f]	reduced	70	45	NA	NA
Filter Strips[g]	reduced	85	NA	60	55
Terrace System	reduced	85	55	80	NA
Containment Structures[h]	reduced	80	65	70	90

NA = not available.
[a] Actual effectiveness depends on site-specific conditions. Values are not cumulative between practice categories.
[b] Each category includes several specific types of practices.
[c] Total phosphorus includes total and dissolved phosphorus; total nitrogen includes organic-N, ammonia-N, and nitrate-N.
[d] Includes methods for collecting, storing, and disposing of runoff and process-generated wastewater.
[e] Specific practices include diversion of uncontaminated water from confinement facilities.
[f] Includes all practices that reduce contaminant losses using vegetative control measures.
[g] Includes such practices as waste storage ponds, waste storage structures, waste treatment lagoons.

http://www.epa.gov/owow/nps/forestrymgmt/



http://www.bmpdatabase.org/docs.htm

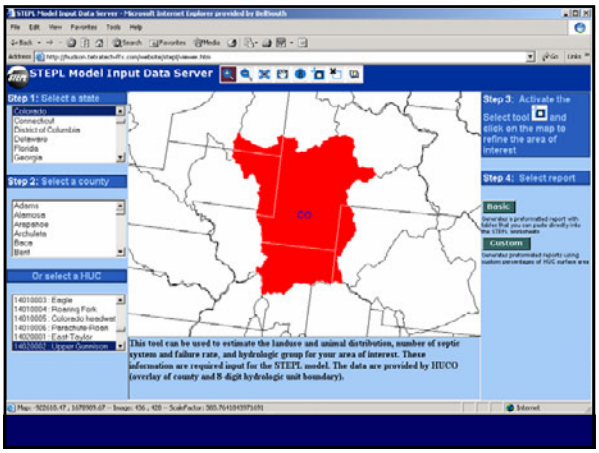


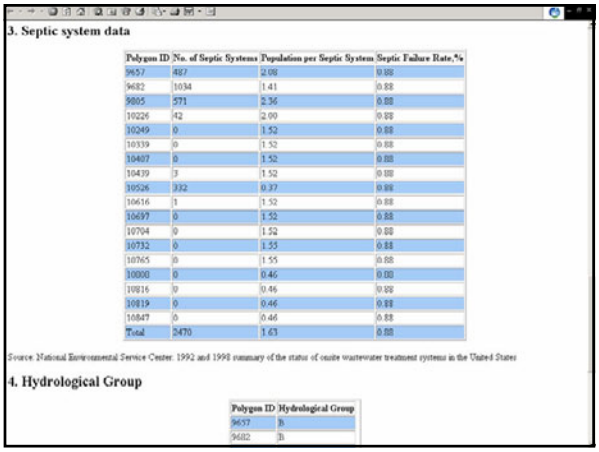
Sample BMP effectiveness table

Table 6-3. BMPs and removal efficiencies used in Site Evaluation Tool BMP percent efficiency

BMP	Percent Efficiency			
	TSS	Total Nitrogen	Total Phosphorus	Fecal Coliform
Wet pond	85[d]	33[a]	51[a]	70[a]
Dry detention	47[a]	25[a]	19[a]	78[a]
Stormwater wetland	76[a]	30[a]	49[a]	78[a]
Sand filter	87[a]	32[a]	59[a]	37[a]
Bioretention	87[d,j]	57[d,h]	76[d,h,j]	90[k]
Enhancedg Grass swale	93[a]	92[a]	83[a]	- 25[a]
Grass swale	68[a]	20[a]	29[a]	5[a]
Infiltration trench	95[a]	51[a]	70[a]	90[a]
25-ft forest buffer	57[b,c]	27[b,c]	34[b,c]	5[k]
50-ft forest buffer	62[b,c]	31[b,c]	38[b,c]	5[k]
75-ft forest buffer	65[b,c]	33[b,c]	41[b,c]	5[k]
100-ft forest buffer	67[b,c]	34[b,c]	43[b,c]	5[k]
200-ft forest buffer	72[b,c]	38[b,c]	47[b,c]	5[k]

[a] Winer, R. 2000. National Pollutant Removal Performance Database for Stormwater Treatment Practices, 2nd ed. Center for Watershed Protection, Ellicott City, MD.





3. Septic system data

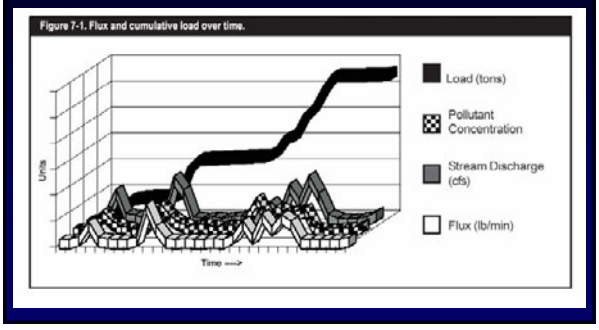
Polygon ID	No. of Septic Systems	Population per Septic System	Septic Failure Rate,%
9657	487	2.08	0.88
9682	1034	1.41	0.88
9805	571	2.56	0.88
10226	42	2.00	0.88
10249	0	1.52	0.88
10339	0	1.52	0.88
10407	0	1.52	0.88
10439	3	1.52	0.88
10526	332	0.37	0.88
10616	1	1.52	0.88
10697	0	1.52	0.88
10704	0	1.52	0.88
10732	0	1.55	0.88
10765	0	1.55	0.88
10800	0	0.46	0.88
10816	0	0.46	0.88
10819	0	0.46	0.88
10847	6	0.46	0.88
Total	2470	1.63	0.88

Source: National Environmental Service Center. 1992 and 1998 summary of the status of onsite wastewater treatment systems in the United States

4. Hydrological Group

Polygon ID	Hydrological Group
9657	B
9682	B

Is modeling necessary?

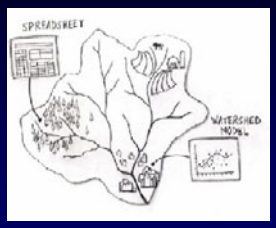


Types of Models

- STEPL (excel spreadsheet with a BMP calculator)
- AGNPS (USDA model that predicts nitrogen, phosphorus, and organic carbon)
  - Training info. at www.sedlab.olemiss.edu/agnps.html
- GWLF (Generalized Watershed Loading Function; Simulates runoff and sed. delivery; *Good choice for nutrients and sediment)*
- HSPF (Hydrologic Simulation Program-Fortran; requires extensive calibration and high level of expertise; simulates hydrology)

Key Decisions in Choosing a Model

- Spatial resolution
  - Watershed, subwatershed, tributary, region, critical areas?
- Time scale
  - Average annual, annual, seasonal, storm, monthly?
- Land use
  - General (ag, urban, etc.)
  - Specific (cropland, pasture land, residential, commercial)
- Pollutant type



Set Goals and Identify Load Reductions

- Refine "big picture goals" set in the assessment phase
  - Restore aquatic habitat in Turtle Creek watershed
  - Meet water quality standards for bacteria
- Translate into Specific Management Objectives
  - Restore aquatic habitat in the upper main stem of Turtle Creek by controlling agricultural sources of sediment
  - Reduce bacteria loads from livestock operations

Selecting Indicators/Targets

- Measurable parameters to link pollutant sources to environmental conditions
  - Peak flow
  - Nutrient concentration
  - Temperature
- Specific numeric value set as target for each
  - Based on water quality criteria, reference conditions, etc.

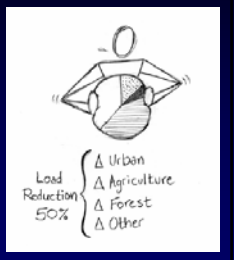
Issue	Suite of Indicators
Eutrophication	• P load • # of nuisance algae blooms • Transparency • Frequency of taste and odor problems in water supply • Hypolimnetic DO in a lake/reservoir • Soil test P in agricultural fields
Pathogens (related to recreational use)	• Bacteria counts • Compliance with WQS (single sample or geometric mean) • # and duration of beach closings • # of shellfish bed reopenings • Incidence of illness reported during recreation season
Sediment	• TSS concentration and load • Raw water quality at drinking water intake • Frequency and degree of dredging of agricultural ditches, impoundments, water supply intake structures

Considerations for identifying management strategies (BMPs)

- Satisfies element "c"
  - Describe NPS mgmt measures & targeted critical areas
- Structural Controls
  - Riparian buffers, grassed waterway, riprap
  - Alternative water devices for cattle
- Nonstructural Controls
  - Erosion control plans
  - Public education
  - Nutrient management plans
  - Prescribed grazing

Proposed management measures

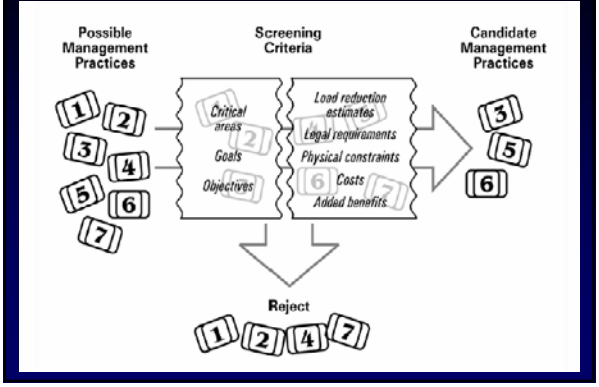
- Pollutant reductions desired
  - Estimate or quantify
  - Metrics selected should make sense!
- BMP types proposed
  - What will lessen your inputs?
  - Applicable to your situation?
- Reductions from BMPs
  - How can you measure BMP impacts?
  - Use literature or actual values
- BMP installation sites
  - Which sites will hit the source(s)?
  - Are there critical areas to focus on?



Selecting the most appropriate BMPs

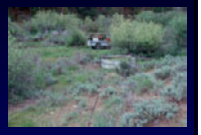
- Look at what's worked and what hasn't
  - Research effectiveness
  - Consider costs/benefits
  - Property ownership/site access
- Look for added benefits
- Use a combination of techniques
- Focus efforts on critical areas; use more or better BMPs there
- Be creative

Identify candidate practices



Prioritizing/targeting BMPs

- Importance of waterbody
  - Drinking water source, recreational resource
- Magnitude of impairment(s)
  - Level of effort needed; public interest/attention
- Existing inputs (stressors/sources)
  - Magnitude, spatial variation, clustering
- Ability of BMPs to reduce inputs
  - Sure thing, or a shot in the dark?
- Feasibility of implementation
  - Willing partners? Public support?
- Additional benefits
  - Recreational enhancements, demonstration



The Bottom Line from US EPA:

- Load reduction *estimates* are critical
- Preliminary info & estimates can be modified & corrected over time, if necessary
- Reasonable management measures can & should proceed even if planning info is not complete